

A HYBRID HAWKWEED FROM THE OLYMPIC MOUNTAINS OF WASHINGTON

ARTHUR R. KRUCKEBERG

The subalpine forest type of the Olympic Mountains is not a likely habitat in which to encounter interspecific hybrids. The vegetation typically presents the aspect of a closed community: Open park-like stands of *Abies lasiocarpa* (Hook.) Nutt. (Subalpine Fir) and *Tsuga mertensiana* (Bong.) Sarg. (Mountain Hemlock) form the arboreal setting for the dense growth of grasses and forbs that clothe the intervening subalpine meadows so typical of the upper montane in the Pacific Northwest. As every botanist knows, a species hybrid in such a habitat would be most unexpected. But equally well-known to the field botanist is the effect of disturbance in creating the conditions for crossing.

Thus I was not particularly surprised to encounter a hybrid hawkweed in a disturbed habitat of the upper montane. Along the northeastern flank of the Olympic Mountains in northwestern Washington, U.S.A., the range is buttressed by Hurricane Ridge, a high subalpine hogback running east and west at approximately 5000 feet elevation. Vegetation patterns are complex along the ridge; exposure and slope change continuously—and abruptly—throughout its length. Basically three vegetation patterns occur here: (1) subalpine conifer forest, (2) upper montane (Hudsonian) meadow on gentle slopes, and (3) the flora of rock outcrops and talus. Midway between the U.S. Park Service lodge on Hurricane Ridge and Obstruction Point to the east, there is an old burn in the meadow-and-forest habitat. A dense cover of grasses and forbs has invaded the site. It was in this situation that on August 1 of 1963 I found two plants which I took to be hybrids between the two very different hawkweeds, *Hieracium albiflorum* Hook. and *H. gracile* Hook. The plants were growing in an open grass-forb swale of what had been a subalpine forest habitat before the fire. The putative parents were in close association with the hybrids (*Kruckeberg* 5689 *a-e*, WTU). In fact, individuals of both species were included in the sods containing the hybrids; the sods were transplanted to pots and have been in greenhouse and outdoor culture at Seattle ever since.

The probable parents of the hybrids can be easily distinguished both morphologically and by their typical ecological preferences (table 1). *Hieracium albiflorum* is a tall plant of open to deep woods; it has densely pilose basal leaves and tends to be nearly glabrous in the inflorescence. Its ligules are dull white in numerous paniculately disposed heads. In the Olympics, *H. albiflorum* probably reaches its altitudinal limit normally well below the 5000 foot level, and is not usually found on Hurricane Ridge; the species certainly is an unexpected visitor to this habitat. It is not improbable that the plants are adventive on the ridge, as they often occur in abundance after fire or other disturbance at lower elevations.

TABLE 1. MORPHOLOGY, CHROMOSOME NUMBER, AND ECOLOGICAL PREFERENCES OF THE SPECIES AND THEIR HYBRID

	<i>H. albiflorum</i>	Hybrid plants	<i>H. gracile</i>
Basal Leaves	10-12 cm long, 2.0-5 cm wide; often remotely denticulate; pilose (copious above, sparingly below)	12-15 cm long, 1.5-2 cm wide; remotely denticulate; shaggy hirsute, esp. at base, hair mostly long hyaline, erect, some short, green and gland-tipped along margin	2-5 cm long, 0.5-1.0 cm wide; usually entire, nearly glabrous, some pale gland-tipped hairs on margin and midrib
Stem	22-97 (120) cm tall, long, straight tawny-hued hairs below, becoming sparse upward to glabrous in inflorescence	36-64 cm tall; long hairs copious below, sparse upward; hyaline short and matted hairs few to none below, more dense upward to copious in inflorescence (appearing stellate)	5-20 (27) cm high; black, gland-tipped, long hairs mixed with short, hyaline and matted hairs, both more dense upward, esp. long black setose hairs
Inflor-escence	Branches with short, greenish, gland-tipped hairs	Pubescence as on stem	Densely hairy: mixture of matted hyaline hairs and blackish, gland-tipped setose hairs
Involucre	Long stiff hairs usually sparse or absent; copious short, green, gland-tipped hairs	Black hairs moderately dense, of two types: gland-tipped, short and in \pm regular rows; scattered long hairs; hyaline matted hairs mostly at base; pubescence less dense than in <i>H. gracile</i>	Pubescence as in inflor-escence but black hairs more dense (gland-tipped when young); long and short black hairs, or all long and gland-tipped
Ligules	pale white; well exserted	ochroleucous to pale yellow	bright yellow; moderately exserted
Achenes	2.5 mm long, pale brown	—————	2 mm long; blackish brown to black
Pappus	tawny or sordid	—————	dull white
Chromosome Number	$n = 9$, <i>Kruckeberg 5618d, 5411</i> (Chelan Co.), <i>4393</i> (Clallam Co.)	$n=9, 5681e$ (two of 186 meiocytes with lagging chromosomes)	$n = 9, 3985$ and <i>5633</i> (Skamania Co.), <i>s.n.</i> (Jefferson Co.)
Habitat Preference	Open to dense coniferous forests; low to middle altitudes; also in disturbed sites	Open grass-forb swales of old burn, Hurricane Ridge, Olympic Mountains, Washington	Subalpine parks and meadows; commonly in closed communities of other grasses and forbs

TABLE 2. POLLEN STAINABILITY AND SEED SET IN SPECIES AND HYBRIDS

	Percent Stainable Pollen*	Number of Seed set
<i>H. albiflorum</i>		
<i>Kruckeberg 5681d</i>	97	high
<i>H. gracile 5681a, c</i>	94, 100 (2 plants)	high
Hybrids		
<i>5681a</i>	27	13 (from 50 heads)
<i>5681e</i>	40-64 (3 heads)	12 (from 46 heads)
2nd Generation hybrid progeny from		
<i>5681a</i>	62, 82 (2 plants)	heads all sterile
<i>5681e</i>	82	30 (from 35 heads)

* Counts of 200 grains in aniline blue-lactophenol.

The other species, *Hieracium gracile*, is truly at home in the sub-alpine meadow habitat. It is surely as much an indicator of the sub-alpine (Hudsonian) zone in the Pacific Northwest as such ubiquitous grasses and forbs like *Deschampsia atropurpurea* (Wahlenb.) Scheele, *Phleum alpinum* L., *Erigeron peregrinus* (Pursh) Greene, *Veronica cusickii* Gray, and *Luetkea pectinata* (Pursh) Kuntze, to name a few. Typically, *H. gracile* is a much shorter plant (3-35 cm) than *H. albiflorum*. It has nearly glabrous basal leaves; the pubescence of the cauline portions increases upward to a dense mixture of long and short hairs in the inflorescence. The peduncles and involucre bracts are coated with both short, matted hyaline hairs and long, blackish (often gland-tipped) setae; the heads in bud have a distinct grizzled and blackish aspect. Incidentally, though the regional manuals (Abrams and Ferris, 1960; Hitchcock, et al, 1955) describe the short hoary portion of the indumentum as stellate, I could not confirm this observation; rather, the matted aspect of the hyaline hairs often give the hairs a criss-cross pattern which simulates the stellate character. *H. gracile* has bright yellow ligules in fewer, more congested heads, as compared to *H. albiflorum*.

The hybrids are clearly intermediate in the features that distinguish the two putative parents (table 1). Stature, foliage, vesture, number of heads, ligule color, and achenes all manifest the influence of both *H. gracile* and *H. albiflorum*.

Both species have the chromosome number, $n = 9$; and from several samples taken in Washington, I have yet to detect any chromosome irregularities during microsporogenesis. Moreover, both species have "good" (well stained) pollen (table 2). Thus, there is nothing to suggest that the two species are apomictic, a condition commonly en-

countered in other species of *Hieracium* (Stebbins, 1950). The presumed sexuality and the close sympatry of the two species provide the opportunity for interspecific hybridization. The expression of intermediate morphology in the suspected hybrids reinforces the judgment of hybridity.

The plants taken from the wild in 1963 have flowered and produced seed in the greenhouse now through 1966. Both species produce copious and viable seed in cultivation. The presumed hybrid plants produce only about 27–64% stainable pollen (table 2). Their heads mature but yield only a few plump seed (table 2). Healthy progeny have been raised from the few good seed harvested from the original wild hybrids and from the second and third generation hybrid derivatives. The later generation hybrid progeny tend more to perpetuate the intermediate features of the original hybrid than to segregate for the parental characters.

Examination of meiosis in microsporogenesis of hybrids reveals hardly any chromosome irregularity. Of 186 sporads examined, ranging from diakinesis to telophase II, only two cells were observed to have any irregular (lagging) chromosomes.

It would appear that *Hieracium albiflorum* and *H. gracile*, though two distinctly different species, can hybridize in the wild. As the hybrids are not wholly sterile, the gene flow could increase by introgression or be restricted to hybrid swarms. Botanists should expect to find the hybrids and their derivative progeny repeatedly throughout the ranges of the two species, presumably most often under the ecological conditions described above. I have yet to encounter reports of other hawkweed hybrids for western North America. *H. albiflorum* overlaps in range with several other western species; other crosses will undoubtedly be encountered.

Note added in proof. A natural hybrid between *H. albiflorum* and *H. argutum* in Monterey Co., California, has been reported by Anderson and Stebbins (1954).

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Department of Botany, University of Washington, Seattle.

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